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ON THE BEST TECHNIQUE FOR HIGH-POWER PHOTO-MICROGRAPHY.

[*Abstract.*]

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I desire to briefly call attention to a few points in the technique of photographic work in relation to the microscope.

To begin with, it is evident that the present tendency is towards some form of apparatus which is entirely separate and distinct from the ordinary working microscope. This is, indeed, an indispensable condition in case photography is to be used as a real aid to every-day microscopical work. The amount of time required to get ready for photography, when the working microscope is used for this purpose, effectually precludes its use in other than what must be termed rather an amateurish way. I am well aware that many members of the Society have done fine work with the ordinary working microscope, and I do not wish to be understood as saying that creditable work cannot be so accomplished. I am simply contending that with appliances especially designed for photography much better work and more of it can be turned out in a given time.

In proof that there is a tendency in the direction indicated, I have only to cite that the catalogues of the principal manufacturers now contain lists of photo-micrographic apparatus designed to be used independent of the working microscope.

For ordinary achromatic objectives the best results will be obtained in high-power work by use of the amplifier, the adjustment being so made as to keep the objective at normal working distance whatever the extension of the camera. To produce this result, certain ready means of adjusting the amplifier are necessary, and these I have already fully described in a paper "On the Use of the Amplifier," an abstract of which appears in the Transactions of this Society for 1887.

In order to get the best results with the new apochromatic objectives it is desirable to use them in conjunction with the projection eye-piece furnished for this purpose; and, as in the case of the amplifier with ordinary achromatics, it is necessary to have some way to readily adjust the eye-pieces for any and all positions of the camera screen, such adjustment also having reference to the maintenance of the objective at normal working distance for any extension of camera whatever.

In this discussion I assume that the elementary facts about objectives are familiar to the members of this Society, and therefore that every person present will admit without controversy the importance of maintaining the objective at normal working distance.

In the Zeiss photo-micrographic apparatus, as at present constructed, the series of adjustments leading to this result are extremely unsatisfactory, requiring a system of trial and error and repeated readjustment for operations which, with the proper appliances, can be easily performed instantly.

This is more marked when we consider that, by the application of the anterior prism-tube, as in the professional photo-camera, and of apparatus for the adjustment of the projection eye-piece somewhat similar to that used for adjusting the amplifier, the corrections for any extension of camera-screen can be obtained without loss of time, the same as with the amplifier.

It can also be obtained with more certainty than by the method indicated by Zeiss in his large photo-micrographic catalogue, from which it appears that the final adjustment, as made with the fine movement of the microscope, may destroy the original adjustment for normal working distance.

I also wish to call attention, briefly, to what appears to be the most convenient position of the camera. After working for several years, I unqualifiedly express the opinion that such arrangement as leaves the operator on his feet in as nearly a natural standing position as possible is, on the whole, the most satisfactory. For this purpose each operator should mount his camera at such a height as to bring the tube to the level of his eye for an easy standing position.

The kind of work done will determine the character of the mounting. If high powers are to be used to any extent, the mounting of the camera should be of the most permanent description, and so constructed on an independent foundation as to be free of all possibility of vibration from movements in the building. For this purpose I have recently introduced, in a building erected for general biological work at Chestnut Hill reservoir of the Boston water works, a brick pier built up from the ground free of all connection with the building. On this the camera will be placed, with the certainity that imperfections in the negatives are due rather to operator and objectives than to vibrations.

The photo-micrographer of the future will probably use two instruments as yet hardly known to the average microscopist, namely: the micro-spectroscope and the refractometer. With these and orthochromatic plates he will obtain results far in advance of our present efforts.

With the micro-spectroscope will be determined the kind of light which each specimen is best capable of transmitting, gaining thereby information as to the proper staining for photographic results. The refractometer will further enable one to correct the results of the previous determination in the selection of a mounting medium, while the information as to the photographic qualities gained by these two determinations will lead, in difficult cases, to the special preparation of an orthochromatic plate exactly suited to the case in hand.

Photo-micrography will, therefore, become in the future a precise art, embodying the application to any and all subjects of definite scientific principles, instead of being, as at present, largely a matter of trial and accidental results.